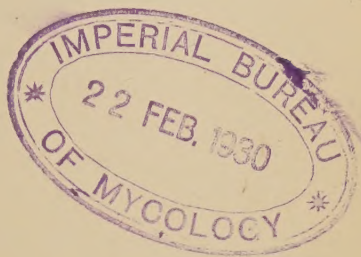


19/11

Zanzibar Protectorate.



Annual Report

ON THE

Agricultural Department


FOR THE YEAR

1928.

ZANZIBAR :

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Zanzibar Protectorate.

REPORT ON THE AGRICULTURAL DEPARTMENT FOR THE YEAR 1928.

Section I.

STAFF.

The following table shows the strength and distribution of the European Staff during the year under review:—

Rank.	Name.	Period in Residence.
Director & Government Chemist	V. H. Kirkham, F.I.C., B.Sc., (London), Dip. Agric. (Cantab)	To January 10th On duty Madagascar to March 17th Zanzibar to March 23rd From Sept. 14th
Assistant Director	A. C. Barnes, F.I.C., B.Sc., (Vict.) A.M.I.Ch.E.	Whole year
Assistant Government Chemist	L. W. Raymond, B.A. B.Sc., (London), A.I.C., A.R.C.S.	From February 19th
Manager of Plantations	Graham Tomson	Whole year
Agricultural Officers	Harold Waterland, Dip. Agric. (Harper Adams)	Whole year
	J. E. Baker, Cert. Agric. (Seale-Hayne)	From February 19th
	J. R. P. Soper, B.A. (Cantab.)	To October 23rd
	T. D. Rutter, B.Sc., Agric. (London), A.I.C.T.A. (Trinidad)	From January 7th

The Director visited Madagascar to obtain first-hand information regarding the clove industry in that country and was absent about two and a half months on this mission. Within a few days of his return he proceeded on privilege leave to England. He was actually in Zanzibar only four months during the year.

The Assistant Director, Mr. A. C. Barnes, was appointed Acting Director during the absence of the Director, and Mr. Waterland acted as Assistant Director.

Mr. T. D. Rutter arrived in Zanzibar and assumed duty on January 7th. His appointment completed the re-organisation commenced in the previous year, undertaken with the object of effecting economy and increasing efficiency.

The European staff now comprises eight officers instead of ten as previously.

The Acting Director made two visits to Pemba, touring the Island and holding meetings with representatives of producers at Weti, Chake Chake and Mkoani.

In March 1929 Mr. A. C. Barnes, Assistant Director, proceeded on leave and whilst in England was appointed Director of Agriculture for Fiji. Zanzibar has lost an exceptionally capable officer and the Arabs a good friend. The promotion of Mr. Waterland to the rank of Assistant Director will be particularly gratifying to Pemba Agriculturists as it ensures a closer personal understanding between the Head Office and Pemba plantation owners than could have been obtained by any other appointment.

Zanzibar will wish Mr. Barnes a continuation of the success which has hitherto marked his career and will congratulate Mr. Waterland on his appointment to a position of greater responsibility, in which his wide experience and intimate knowledge of local affairs will have greater scope for exercise.

I desire to express my appreciation of the invaluable services of the Head Clerk, Mr. D. F. Santamaria.

Section II.

THE CLOVE INDUSTRY.

A. PRODUCTION.

The year 1928 was an eventful one in the history of the clove industry in this country, not only in regard to the important fiscal changes which took place, to which I will refer later, but also as witnessing the conclusion of a succession of four very large crops—a unique occurrence—and the beginning (and in large part the harvesting) of the smallest crop for sixteen years.

The calendar year is a most unfortunate period to cover in an annual report upon agriculture in the Southern Hemisphere and the Tropics, where the seasons are in some respects the reverse in point of time of those of the Northern Hemisphere. The International Institute of Agriculture has wisely determined the period July to June for the purposes of the World Agricultural Census in the Southern Hemisphere. Taking advantage of the otherwise unfortunate delay in preparing this Report the history of the clove crop commencing in July 1928 can be followed to its conclusion in 1929, and, what is

equally important, the state of the market can be noted up to the time of the commencement of the harvesting of the succeeding crop.

Table III in the appendix gives the quantity of cloves brought to town during each of the past 33 seasons. A glance at this will show the truth of the above statement, that a succession of four very large crops (July 1924 to June 1928) is unique. The production in this period amounted to 28.1 lakhs of fraslās against an average of 20.6 lakhs in the five preceding periods of four years and 21 lakhs in the immediately preceding period. The nearest approach to this record occurred in the four seasons July 1913 to June 1917 when 26.2 lakhs were brought to Town. In this latter period there were two exceptionally heavy crops and two average crops.

It is not surprising to find that before the end of the record period in 1928 the price of cloves had fallen very considerably, and it is, therefore, interesting to make a review of the quantities produced and the average prices obtained in previous periods. The following table gives the quantities produced (or more accurately brought into the town of Zanzibar), the value of the same and the average price, in groups of four seasons. The object of grouping is to eliminate minor fluctuations and bring out any general tendencies which might otherwise be obscured:—

Seasons July to June	Quantity in 1000 frās.	Value in lakhs.	Average price per frās. in Rupees.	
			Rs.	Cts.
1896-1900	1,413	75.50	5	34
1900-1904	1,155	81.58	7	06
1904-1908	2,068	198.42	9	60
1908-1912	2,015	186.86	9	28
1912-1916	2,243	226.77	10	09
1916-1920	1,898	300.04	15	80
1920-1924	2,105	406.46	19	30
1924-1928	2,810	436.34	15	53

Let us frankly admit that the final entry in the fourth column is not quite what might be wished, but it need not give rise to foreboding or despair.

Pleasing features are the evidence that the trees are still in full bearing, that during this last period they have produced more wealth to the country than ever before, and that there is, apart from the check in rise of price during the last period, obvious indication of a greatly increased World demand for our produce, extending over a period of thirty odd years. Our recent prosperity is not exactly a mushroom growth.

The subject of price brings us to the law of supply and demand. Apart from seasonal variations, which are very great, the second

column of the above table shows that during the 20 years from the middle of 1904 to the middle of 1924 the average production of four-year periods has been remarkably steady, and that this even production has been accompanied by a continuous rise in price. The subsequent fall requires careful consideration.

We may draw the conclusion that the World's markets are saturated with an annual production of $5\frac{1}{4}$ lakhs of frassas at a price of Rs. $19\frac{1}{2}$ per frassa, and that a fall in price will occur rapidly if more is placed on the market. It must be remembered that Madagascar production has increased rapidly, and the extra seven lakhs of frassas Zanzibar put on the market during the four seasons 1924-1928 does not represent quite the whole of the surplus. We have every reason to expect our production to resume its normal level, and unless Madagascar rapidly increases, or the markets fail, than the price should regain the figure which we previously reached. In my earlier remarks it was stated that the 1928-29 crop could be followed, and although accurate statistics are unfortunately not available owing to the Excise Duty on cloves no longer being taken on their entry into the Town, with the consequence that the Customs do not handle the clove arrivals, nevertheless computations by the Comptroller of Customs and Mr. Pirmohammed Hirji, who for many years has published a monthly review of the clove position in Zanzibar, show that the July 1928 to June 1929 crop was about 2,00,000 frassas and that the price rose to Rs. 28-30 cts. per frassa in Town which, with the duty in cash added, means Rs. 33-90 cts. per frassa f.o.b. Moreover, the succeeding large crop (computed to be 8 lakhs of frassas) has, after a natural fall from the very high prices obtaining during the 1928-29 season, maintained a quite satisfactory level and nearly half-way through the harvest is still about Rs. 18 to 19 per frassa f.o.b. Particulars of the 1928-29 crop and of the five preceding crops will be found in Table II of the appendix.

History repeats itself, and it is interesting to revert to the four seasons July 1913 to June 1917, when, as has been shown, 26.2 lakhs of frassas were produced. The following season (1917-18) was a very small one (2.98 lakhs) with high prices (about Rs. 19); then came the enormous crop of 1918-19 ($8\frac{1}{4}$ lakhs) which sold at the remarkably good figure, for ten years ago, of over Rs. 14 per frassa. So far the comparison holds—four large crops, one very small and one unusually large crop with a well-maintained price. Will history still further repeat itself and see a small crop follow this one with prices rising to a record figure as they did in 1919-20? Buyers and sellers will alike take thought upon this matter.

B. MARKETS.

Events during the year caused much thought to be given to the markets absorbing our production. The visitor to Zanzibar is invariably struck by the sight of such vast quantities of cloves, and is perplexed as to what becomes of them. He is frequently informed,

quite erroneously, that the greater portion goes into the still for the manufacture of clove oil. Precisely where the cloves go to, or what happens to them, cannot be stated. There is such a large amount of re-distribution between different countries of the world that destination on leaving Zanzibar can but vaguely indicate the regions of consumption. Again, what proportion of the spice going to industrial countries is utilised in chemical manufacture has not been ascertained. It appears from such knowledge as we possess of destination that during the past thirty odd years the East has taken one-half of the crop. There have been years when the tide has set more in one direction than the other, but there is hardly a definite indication of a permanent increase in consumption of East over West or vice versa. Taking the British India market, and in the last two or three years combining the Dutch East Indies and Straits Settlements purchases therewith, the position is as follows:—

East India Market.		East India Market.	
Period.	Percentage.	Period.	Percentage
1897-1900	47.3	1913-1916	43.5
1901-1904	46.7	1917-1920	52.1
1905-1908	38.3	1921-1924	41.6
1909-1912	45.5	1925-1928	53.0
Average 16 years	44.45	Average 16 years	47.55

It would be well to point out that while the above figures indicate the position as regards the largest oriental markets they do not take into account shipment direct to other countries in Asia. Nor again is it stressed that the increase from 44.45 per cent to 47.55 per cent in the average consumption of this particular market during the two periods of sixteen years each is necessarily an indication that this market is expanding at the expense of the rest of the world. It is quite possible that cloves entered the Dutch East Indies and Singapore by other routes than *via* Bombay in the earlier years and that the consumption of this group has not actually increased. There are, however, other indications that the Oriental market has recently expanded as witness the following figures for the distribution of the clove exports during the year 1928:—

DESTINATION OF EXPORTS, 1928.

Continent.	Quantity, Fraslas.
Asia	... 3,52,566
America	... 83,824
Europe	... 60,592
Africa	... 5,725
Australasia	... 3,222
	5,05,929

The figures for Africa include 4,045 fraslas for Egypt and 400 fraslas for Djibouti which in neither case will represent ultimate destination, the former probably going to Europe or America and

the latter very probably to the Dutch East Indies. These corrections would not, however, materially alter the fact that Asia has taken 70 per cent of the year's export. It will be borne in mind that the exports during the year comprised a large quantity of the 1927/28 crop, selling at low prices, and in the second half of the year the new 1928/29 crop and a considerable proportion of hold-over selling at high prices. The year's export of 5,05,930 fraslās was valued at Rs. 86,78,185 an average of Rs. 17-15 cts. per fraslā.

Having glanced at the geographical distribution of the exports, let us now come to the point of utilisation and tackle the problem which gave rise to our survey of markets. Cloves are used whole or ground, raw or cooked, as a condiment in food, or taken by themselves or with other condiments for chewing. That represents what I shall refer to as the Spice Market. Cloves contain about 17 per cent of essential oil utilised in such diverse ways as a basis in certain types of perfume, as a bactericide in tooth-pastes and dental dressings, as a preservative in adhesives and dopes and, last but not least, in the manufacture of vanillin, a beautiful silky crystalline substance occurring in and giving the flavour to the fruit of the vanilla orchid. This last I will refer to as the Vanillin Industry Market, and I will take this last and least important one first as it has been the cause of disquietude.

(1) *The Vanillin Industry Market.*

Manufacturers of vanillin from cloves had for some time past expressed a fear that competitive methods of manufacture were endangering their position. With the rise in the price of cloves in 1928 the position, in England at any rate, became untenable, as vanillin manufactured from guaiacol—a tar product—was offered on the market below the actual cost of the cloves which would have been required for its production, i.e. at the end of the year vanillin ex guaiacol was offered at 13s. 6d. per lb. whilst 11 lbs. cloves (stated to be required for the manufacture of 1 lb. vanillin) were costing over 15s. In the earlier part of the year, before this position had become quite so acute, the manufacturers made it clear to Government that unless they could obtain their raw material at a certain figure it would be impossible for them to continue the process of manufacture from cloves. In July a Decree was enacted providing for a rebate of the whole or part of the Clove Duty (according to the price of cloves) upon cloves utilised in the manufacture of vanillin, subject to certain conditions.

This was the utmost that Government could do to support our Vanillin Industry market, but could it possibly be successful? Secondly, would the loss to the country in revenue be less than the loss through a fall in the price of cloves should this particular market be lost?

The answer to the first question—could it succeed?—would seem to be doubtful in view of our knowledge of the general upward tendency in the price of cloves in the spice market, but the scheme

might keep the process going until more definite information were available. That question would soon answer itself and the second question need only be considered if the rebate of the duty enabled manufacturers to continue. There seemed to be an indication that an extra seven lakhs in four years had brought the price down some Rs. 3.75 per frasila. This example indicates that a $33\frac{1}{3}$ per cent increase in quantity brings the price down (when at Rs. 19-30) over 19 per cent. Let us suppose for a moment that our average crop is divided as follows:—

4,00,000	Spice market
1,20,000	Vanillin market
<hr/>	
5,20,000	Total.

We have seen that over a period of four years this quantity can be sold at Rs. 19-30 per frasila. If now the Vanillin market be lost, the Spice market has a surplus of 30 per cent thrown upon it and the price might therefore fall about 17 per cent, that is we should expect it to fall from Rs. 19-30 to Rs. 16 per frasila.

This fall in price represents a loss of Rs. 17,16,000 to the country, whereas the loss of revenue by making rebate of Rs. 3-30 per frasila on 1,20,000 frasilas is only Rs. 3,96,000.

If the consumption of the vanillin market has been materially less than the 1,20,000 frasilas per annum which I have suggested, the loss would of course be proportionately less. There are no statistics available for a normal year's consumption, and the figures and calculation are to be regarded rather as an example to indicate the inevitable effect upon the market of such a disturbance as that with which we are threatened and indeed are already experiencing. I need not say that although the higher price is naturally welcome to the producer the industry would be perfectly safe if an average price of Rs. 16 per frasila could be maintained.

(2) *The Spice Market.*

The fact that the spice market has raised the price of cloves out of the reach of the vanillin manufacturer cannot be regarded as a disaster to Zanzibar. It should be our endeavour to expand the spice market so that prices shall not fall as the result of the withdrawal of that competition. There is obvious room for expansion. Reference has been made to the difficulty most people experience in understanding how so many cloves can be consumed. To such it will come as a surprise to know that an average crop would only provide the people of the world with one clove a week apiece.

Following the distribution of the exports of cloves during the year 1928, the consumption per head of the population is approximately as follows:—

Asia	one clove a week.
America (North)	two cloves a week.
Europe	half a clove a week.
Australasia	one clove a week.
Africa	two cloves a year.

In Asia the greater part of the cloves is consumed in India and the Dutch East Indies. In the Dutch East Indies the consumption is 1 to 1½ cloves a day, and doubtless in many parts of India the consumption is still greater.

When it is seen what amounts can be consumed by nations it is apparent what enormous possibilities there are in the expansion of the spice market.

If the truth of the statement "a clove a day keeps the dentist away" were appreciated and acted upon by even one-sixth of the European races it would double the world's demand. An ounce of cloves contains about 300—Zanzibar cloves are somewhat smaller than those from Penang—and costs retail perhaps three pence. A penny-worth of cloves means one a day for three months—it is not an expensive treatment for an effective cleansing of the mouth! Even if the people in Great Britain alone did this it would take a lakh of fraslās and compensate us in the event of the loss of the vanillin industry market.

It is not my purpose to indicate methods of advertising cloves but merely to show that in this Gem of Nature one three-hundredth of an ounce in weight, possessing the desirable properties of pleasant odour, strong aromatic taste, wholesomeness, powerful preservative action, and obtainable with infinite satisfaction to the distributors at the rate of one hundred a penny, we are producing an article which must surely find a greater demand in the world as its merits become more widely known.

C. REGENERATION OF THE CLOVE INDUSTRY.

The vicissitudes of the clove industry are more apparent to the man on the spot, whether producer or merchant, than the progress shown by the figures for groups of years given in this report would indicate. There was in the first half of 1928 a great depression, the price falling to Rs. 11½ per fraslā duty-paid, that is the producer was obtaining only Rs. 8½ or owing to local marketing arrangements being unsatisfactory, in Pemba particularly, even as low as Rs. 7 per fraslā. At such a price the producer could not carry on indefinitely. It is not surprising that from time to time there is expressed an opinion that some more reliable staple crop should be found to replace cloves. This opinion is more often expressed by the onlooker than by the plantation owner, the latter knowing that it cannot be done for economic reasons in his own lifetime and therefore not interesting himself in the theory. There is perhaps a tendency to plant coconuts instead of cloves, where gaps have occurred, for which there are three reasons:—(1) There are many places where cloves have been planted on unsuitable soil, and it is sound economy to replace by nuts. (2) Experience has shown that young cloves in narrow gaps grow into tall, weak trees. (3) Coconut planting is much cheaper as the seedlings require less attention. Left to itself, the industry must certainly deteriorate in the course of time. The

magnificent clove plantations established by the Arabs between a half and a century ago, the envy and despair of the present generation of planters whether in this country or elsewhere, were established systematically, and to maintain their value and productivity at its highest level must obviously be regenerated systematically. That is to say, the bearing trees of fifty years hence must have had an equal opportunity of proper development to those which are responsible for our wealth to-day.

I am more than ever convinced that Zanzibar is "on a good wicket" and that our main endeavour should be to maintain our clove industry.

The necessity for Government action in the matter was realised many years ago, and in 1922 a scheme was put into operation whereby a bonus was granted upon each seedling planted, payments being made at the end of the first, third and sixth years. In 1926 notice of termination of the scheme was given as it was realised that, although it had done some good, it was a far from satisfactory method of bringing about systematic regeneration.

The seedling bonus scheme was not only an unsatisfactory machine to accomplish its object but proved a Frankenstein Monster to the Department of Agriculture. The notice in 1926 could not bring the scheme to an end before 1932, and by 1928 it was realised that the monster was out of hand. Claims kept pouring in and the work of sealing and checking was hopelessly in arrear. It was decided that it would be better to make a composition payment on all plantings and bring the scheme to an end as quickly as possible. The greater part of the paying off was accomplished in 1928, but it will not be until nearly the end of 1929 that the final payments will have been made.

The fundamental error of the scheme was the adoption of the seedling as the subject for bonus instead of an area of land. When the mistakes of the past have been buried, but not forgotten, it will be time to take the matter in hand in a systematic way. Failure is the signal for renewed effort, but there must be no more experiments with doubtful methods—the way to maintain a plantation of trees is not a matter of opinion but of knowledge.

Table IA (c) in the appendix shows the year's working in connection with this scheme.

Section III.

THE CLOVE GROWERS' ASSOCIATION.

Having reviewed the position of the industry, it is fitting to turn attention to the people engaged therein.

The Clove Growers' Association, founded in the early part of 1927, developed considerably during its second year of existence. In the formation of this Association I had three objects in view:—

- (1) To regulate the cost of production by fixing wages by consent.
- (2) To gain control of the market.
- (3) To obtain funds for the systematic regeneration of the plantations.

There were few believers in the movement two years ago, but the achievement of the first of our objects has given confidence to the members themselves and acquired recognition for the Association from those outside.

At the beginning of 1928 it was decided to commence operations upon the second object of the Association, viz. control of the market.

It had originally been decided to increase the bonus on bearing trees (a rebate on the Clove Duty) from some five to seven and a half lakhs. The Council of the Clove Growers' Association, after careful deliberation, agreed that instead of increasing the bonus on trees the additional rebate money should be paid on produce brought into the Association. It was estimated that, commencing with the new crop in July 1928, it would be quite possible to give half a rupee per frasila. As events turned out the crop was small and the bonus would have amounted to one rupee a frasila. With a view to handling this crop two motor lorries were purchased.

Policy was, however, changed, and instead of an increase in bonus the Clove Duty was reduced and the Association, so far from having additional funds with which to organise the handling of the majority of the crop, was left without a single rupee. No further progress in the accomplishment of the objects of the Association has been possible.

Although this change of policy was a great set-back to the development of co-operative marketing in this country—the producers can only be paid or forced to combine, and the latter alternative is out of the question—to the individual producer the payment of the Clove Duty at the moment of export is an undoubted advantage. Previously Government took a quarter of the crop and sold weekly in public auction. Buyers had all the cloves to bargain for and the price depended upon the competition. Now the competition and fixation of price occurs before the duty is paid, and it is certain that this must act advantageously to the producer, who is now himself disposing of the whole of his produce instead of three-fourths of it as formerly.

Although the new method of payment of duty is an obvious advantage to the producer, it would not appear that the reduction of the amount payable in lieu of cash bonus is anything but a loss. Whoever paid the greater part of the duty under the old system it is

fairly obvious that the consumer pays it now, as witness the following figures:—

Month.	Average price in Zanzibar.	Price f.o.b.		Duty.	
	Rs. Cts.	Rs.	Cts.	Rs.	Cts.
1928.					
July	19 76	23	16	3	40
August	17 82	21	22	3	40
September	18 55	21	95	3	40
October	21 51	24	91	3	40
November	24 74	28	34	3	60
December	24 10	27	70	3	60
1929.					
January	27 26	30	86	3	60
February	27 02	30	62	3	60
March	28 02	33	62	5	60
April	25 41	31	01	5	60
May	26 07	31	67	5	60
June	26 13	31	73	5	60

The first year of collection of Duty in this manner has provided most important information, and its lessons will enable future policy to be determined with a fuller knowledge of the incidence of the duty upon the industry than has hitherto been possible.

There were two objects in view in putting the Association in a position to control the market:—

- (1) Ensuring that all producers got a fair price for their cloves.
- (2) Holding over a surplus from a heavy crop so that the producers, the majority of whom have no capital, should have a more regular annual return and thus avoid the present necessity of having recourse to money-lenders.

Although the Association cannot now ensure these advantages to its members it is doing something in that direction by affording facilities for transport and negotiating sales in Town. Government has also loaned the Association funds to enable advances to be made to members against cloves stored in godowns free of charge. It is therefore possible to accomplish something of our object, but these benefits are unfortunately beyond the reach of many producers who are compelled to sell their produce to the middlemen to whom they remain perpetually indebted.

Apart from its inability to enter upon the large marketing scheme, the general progress of the Association was remarkably good. The minutes of the Council Meetings testify to the interest taken in all matters affecting the industry. The Acting Director of Agriculture organised a Conference in July which brought together the Zanzibar and Pemba branches of the Association and did much to weld the whole together and impress upon all the importance of the organisation. His Excellency the British Resident addressed the Conference and assured the Association of his keen interest in its welfare.

In the latter part of the year schemes were discussed for financing the Association by means of a levy on cloves of Re. 1 per frasila, with the object of establishing a Land Bank. It was realised that the Association could not handle the crop unless it financed the plantation owners. After prolonged discussion in numerous meetings the Council unanimously recommended a levy. Pemba was less enthusiastic but eventually agreed to a half-rupee levy if Government would make loans at low interest to free them from their present indebtedness first.

It was urged that if the levy were collected with the clove duty the producers would not feel the pinch and that with a guaranteed income averaging over five lakhs per annum there would no difficulty in obtaining the necessary capital.

It cannot be claimed that the agreements arrived at by the Councils in Zanzibar and Pemba were either understood or accepted by the rank and file of the plantation owners in the country. Even in dealing with the members of the Council it was extremely difficult to make the bare principles of organisation understood and to keep the ground clear of a tangle of detail.

The most erroneous ideas of the scheme became current. On the 14th January of the present year the Arab Association (a political body) wrote to say that very many clove growers disagreed with the proposal before the Clove Growers' Association, especially certain points, four in number, which the letter duly set forth. It is curious that these four points were complete misrepresentations of the scheme, and one could only agree with those who rejected such proposals. The Arab Association kindly accepted my offer to address meetings at the Association. Numerous meetings were held and before the end of the month the following recommendations and resolutions were passed:

“Agree that the producers should regulate the output of cloves on the market and thus stabilise the price at a figure which will be profitable to the producers if the difficulties in the way can be overcome” (22 Arabs present; 21 in agreement).

“If an Agricultural Bank be founded with not less than 30 lakhs capital the clove growers will agree to a levy of rupee one per frasila to raise the interest and repay the capital advanced. The property of members will be pledged to the Bank as Security.”

“This meeting recommends that notices printed in Arabic and Kiswahili should be distributed giving a short description of the proposals for the establishment of the Land Bank and the levy. Meetings should be held in the plantations in Zanzibar and Pemba to discuss the proposals with plantation owners and, finally, petitions should be submitted to Government asking that the necessary funds be provided for the Bank and that Government would undertake the collection of the levy” (Arab Association 29th January, 1929).

It should be stated that these resolutions were drawn up by Arabs and that the Director of Agriculture was not responsible for even suggesting them.

It is apparent that there is a strong desire for improved credit facilities, but that the operation of Association marketing is not a matter which strongly appeals to the Arabs.

Immediately after these meetings with the Arab Association a Committee was appointed by His Excellency the Acting British Resident to consider the Rationalization of the Clove Industry.

It was not considered proper to pursue the recommendation of the Arab Association meeting of the 29th January in view of this action. The Report of the Rationalization Committee leaves the matter more or less as it was, save that there is perhaps a greater appreciation of the difficulties involved in banking as well as marketing, with the result that there is a general disposition to leave the matter alone for the present.

Table I in the appendix summarises the transactions of the Association during the year.

Section IV.

THE COCONUT INDUSTRY.

The position of this industry is most unsatisfactory. A large proportion of the local produce is quite unfit for export and merchants are compelled to blend it with copra imported from the mainland and with whatever of fair merchantable quality can be obtained locally.

I was on one occasion invited by a leading exporter of Zanzibar to accompany him first to the Old Customs to see the arrivals from Pemba and then to his own godown to see the process of making an exportable mixture.

There were stacks of bags from Pemba, the contents of which can only be described as an almost black, greasy slime, of unpleasant odour. On this particular occasion fair merchantable copra was changing hands at the Customs at Rs. 4 per frasila and this stuff from Pemba was fetching Rs. 2½.

In the merchant's godown I saw copra, not quite as bad as that just described but still a disgrace to the country, being spread out in alternate layers of several inches thick with a good quality article. That is the general and necessary procedure in dealing with the bulk of our local production.

The Cause:—Primarily and principally the trouble is due to the gathering of immature nuts; carelessness in preparation completes the ruin.

The meat is the last thing formed in the coconut and is only deposited in the shell when the nut is approximately full-sized. It is quite easy to tell when nuts are ready to pick, however, as the position of the bunch on the palm indicates its age and by the time the meat has been completely deposited in the shell there has been a drying out of the tissue between the fibres of the outer husk which can be detected by tapping the nut with the hand and noting the sound emitted. There is little excuse for accidental gathering of immature nuts.

Nuts are deliberately gathered before their time for two reasons:—

- (1) A quarterly gathering of nuts is frequently sold on the palms. The purchaser is naturally anxious to get whatever he can and the pickers are instructed to strip the palms of all full-sized nuts.

Annual contracts reduce this stripping to some extent as the purchaser's own interest would be to let the nuts mature so that he would obtain more copra, and confine the stripping to the last picking of the year.

There is some indication, however, that the pickers have got into such a habit of gathering immature nuts that unless continually warned and fined for disobedience they will gather nuts off a palm without troubling as to whether they are ripe or not.

- (2) It appears to be an unwritten law in the land that fallen nuts are common property. Nuts are none too safe perched on the top of a sixty-foot pole; to let them fall to the ground is to give them away—hence they are picked unripe.

It is good practice to keep gathered nuts in clamps for some time (on the Government plantations from 1 to 3 months) before breaking. Ripening proceeds and the meat gets firmer and then dries out better. Here again thieving is a trouble and on Government plantations the clamps have to be guarded at night and lighted with hurricane lamps. With small clamps these necessary precautions would swallow up the profit. There is a great difference not only in quantity but in quality between the meat of ripe and unripe nuts. As to quantity it varies from a full complement to nothing at all, and in quality from a hard brittle substance containing some 40 per cent of oil to a soft gelatinous mass, somewhat resembling the white of a soft boiled egg, containing but little oil. Until the meat has hardened in the nut it will not dry out and make copra. Its presence in a mixture is a source of trouble as it leads to putrefaction of the whole mass.

From 6,200 Zanzibar nuts (which are rather small but rich in oil) one ton of copra of the best quality can be made. Gathered before they are ripe the yield may be very low indeed. Not only is there the loss in actual quantity to be considered, but the price of what is obtained sinks in proportion. If three-quarters of the yield is obtained

it is safe to say that the price per frasla (or ton) will have fallen at least in the same proportion, that is to say if the 6,200 nuts were so immature as to yield only 15 cwts. of copra the value of that copra would be not more than £15 per ton if average quality were £20. Indeed, the price would be even less for a sample consisting entirely of immature meat. Even on this basis, however, three-quarters of the yield at three-quarters of the market price represents a loss of about 44 per cent. I have already quoted the case of a bad sample—not entirely of unripe meat—selling at Rs. 2½ per frasla when average quality was Rs. 4—a loss of 37.5 per cent on the price alone; what loss had been sustained in the weight produced from the nuts is unknown.

A large exporter of copra has expressed the opinion that Zanzibar loses 30 per cent per annum of what it should obtain for copra exports. He is possibly correct: if so the country is losing through mismanagement of the industry some ten lakhs of rupees per annum.

Remedy.—These facts being known, it would have been expected that producers in their own interests would have remedied matters. The causes, however, are such that individual effort is not likely to be made. There is a natural feeling that a man can do what he likes with his own property as long as he is not a nuisance to anyone else, and that if there is a market for inferior produce it cannot be denied him to supply that market. I have personally entertained such ideas, but my conclusions now are that there is not a demand for inferior produce; that, in fact, its inferiority has to be masked by admixture with a good quality article; and that it is not in the interests of the producers themselves that they should be able to dispose of produce which is not itself marketable. If this view be accepted the position might be remedied by prohibiting the export of copra containing more than a certain percentage of immature nuts and of moisture. There is this, however, to be considered; in the year 1928, 1,22,000 cwts. of copra were imported, largely for admixture with the 1,87,000 cwts. local production. Any purely export control of quality would in all probability lead to a further increase in the quantity imported and a reduction in price of the local article. It would seem to be a case in which internal control would be necessary.

So much for the quality of Zanzibar copra. As to quantity there has been a further falling off. In 1926 we were concerned with finding an explanation for the extraordinary increase in the amount exported. Since then the quantity has decreased and any attempt at explanation may well be deferred until further experience has shown more clearly what the normal should be. The years 1925 and 1926 were so remarkable for the increase in exportation of copra that the average for the past few years is perhaps an untrustworthy guide as to the true position. Reference should be made to Table VI in the appendix, where the growth of the exports in copra is shown and the abnormal position of the years 1925 and 1926 appears.

Section V.

ACTIVITIES OVERSEAS.

A. VISIT TO MADAGASCAR.

The published statistics of clove production in Madagascar indicated a rapidly expanding industry in that country and, after correspondence had passed between the two Governments, I was sent on a mission to Madagascar to compare the conditions obtaining there with those in Zanzibar, and to ascertain the present position and future prospects of the clove industry in that country.

On my return to Zanzibar in March a report was presented to Government and was subsequently published for general information. It is unnecessary here to give more than the briefest summary of the results of that visit.

The clove industry was introduced into the island of Sainte Marie, lying off the east coast of Madagascar, in 1874. It is not improbable that this was a sequel to the cyclone in Zanzibar in 1872. Both Zanzibar and Sainte Marie were busy planting cloves in 1874 to replace the havoc caused by the cyclone. It would not appear that any extensive planting occurred in Madagascar itself until a later period—probably in the nineties or the beginning of this century. In the year 1898 there was a distinct tendency for prices to rise and although for the following five or six years the progress was not phenomenal the stimulus was probably sufficient to set the industry going on the “mainland” of Madagascar.

The sudden rise in the value of cloves in 1918 could not fail to find a response in Madagascar, and attention during the next three or four years was concentrated upon clove planting to a quite disconcerting extent. In the early twenties this attention was manifest in the sudden appearance of thousands of acres (estimated at 25,000) of young clove plants.

The opinion I formed of these plantings was that many would perish from lack of attention and that there would be inadequate labour for picking when the survivors, if a large proportion, reached maturity. Nevertheless the production of cloves in Madagascar must increase tremendously in the future. That country has already put 1,500 tons on the market in one year and there is the possibility of it raising this figure to 4,000 tons. From what has been said about the effect of increased production upon the price it is obvious that steps should be taken to increase the demand so that the producers, whether in Zanzibar or Madagascar, shall not find themselves deprived of any profit.

This aspect of the case was discussed with the Governor-General in Madagascar, His Excellency M. Marcel Olivier, and it was agreed that the exploration of new markets for cloves was a matter of equal concern to both clove-producing countries.

The most striking difference between the activities in the two countries is that in Madagascar the production of essential oil from cloves, stems and leaves (particularly the latter) is an important and rapidly expanding branch of the industry, whereas in Zanzibar distillation of oil of cloves is prohibited. In March 1928 producers in Madagascar were getting 2s. 6d. per lb. for leaf oil. A year later they were getting over 6s. per lb. Although the rapid expansion of the distillation industry in Madagascar may have been viewed with apprehension in Zanzibar I think it not improbable that it has done us service in enabling clove oil vanillin to keep in the market when cloves were forced out of the distillers' reach by the spice market. Unless, therefore, more oil is produced, and the price brought down to a level to compete with guaiacol and safrol, Madagascar may find that her market will shrink. It would seem that large production of leaf oil in Zanzibar alone can save the vanillin market, and the apparent competition between Madagascar and Zanzibar would again prove in the long run to be a matter of mutual benefit.

B. CONFERENCE WITH DISTILLERS IN LONDON.

In an interview with the Director of the Imperial Institute, Lieut.-General Sir William Furse, K.C.B., in London, the question of the utilisation of leaves for the production of oil and the prospects of local distillation succeeding in solving the vanillin problem were discussed. Sir William Furse advocated a conference with representatives of the principal manufacturers of clove oil and vanillin so that the position could be freely discussed. The Director kindly undertook to convene a meeting, which eventually took place at the Imperial Institute on the 13th July, 1928, Sir David Prain, C.M.G., F.R.S., in the chair. The Honourable W. Grazebrook, M.C., of Zanzibar, was fortunately in England at the time and was able to attend the meeting.

I stated my personal opinion that with the inevitable fluctuations in price of cloves, owing to the irregularity of production, a system of drawback of duty could not prevent the cost of cloves to distillers rising above the economic level which they had stated was necessary for satisfactory competition with other processes of manufacture, the variations in price being some 200 per cent, whereas the total rebate of duty could not affect the price more than 20 per cent.

The view was expressed that local distillation from refuse which did not go to the spice market, and whose value would therefore not be affected by any other consideration than the demand of the distillers, appeared to offer a solution to the problem of how to obtain eugenol at a price to compete with guaiacol. The position in Madagascar was described and the meeting was evidently interested in the comparison drawn between the two countries.

Numerous questions were asked concerning cost of production which in the absence of data—no distillation having been carried out on a commercial scale in Zanzibar—could be given no definite

answers. The representatives agreed to the suggestion that after consultation between themselves a questionnaire should be drawn up and submitted so that such information as was available on every item of importance in connection with the project could be made known to them after I had returned to Zanzibar and had had an opportunity of making investigations.

This was done and a questionnaire of some 27 questions was submitted.

On return to Zanzibar information was sought on these matters and a reply duly despatched.

The results of these efforts must be awaited. The interested firms in general are not disposed to sink additional capital in exploring a solution to the cheap eugenol problem. If in another direction cheap guaiacol is being offered the safest plan appears to them to take that.

The matter is by no means disposed of, however, and one firm of distillers is taking a large experimental consignment of leaves from which to obtain a more accurate estimate of the position.

There are many questions of great importance to be considered: matters of policy both as regards the State, the plantation owner and the fertility of the land itself, as well as those concerning the actual manufacturing business. All these matters are under consideration. It is our hope that Zanzibar may drive guaiacol vanillin off the market.

Section VI.

AGRICULTURAL EXPERIMENTS.

There has been practically nothing done in this country in the matter of experiment since the closing of Dunga as an Experimental Station some twenty years ago. Confidence in cloves was then so strong that it appears to have been thought at the time that it was a waste of money to continue the observations upon cocoa, rubber, coffee, tea, vanilla, kola and other crops which were maintained at Dunga. Recently there have been expressed opinions that the Department of Agriculture should be in a position to give the country a new industry if its present one comes to grief. Although my own confidence in cloves remains unshaken, in spite of production elsewhere and the as yet unsettled battle for the maintenance of the vanillin market, nevertheless it is justifiable to give attention to side-lines so long as it does not detract from consideration of the more important matter of the maintenance of our heritage in cloves.

The programme which the department has in view is to test out a considerable variety of crops with the object of ascertaining their general suitability to our soils and climate. As the result of these experiments a selection may be made of the more promising crops for large-scale experiments to ascertain the costs of establishing,

bringing to maturity, harvesting, treatment of produce for marketing, marketing, cultivation and maintenance of plantations. The difficulty to be faced is that of finding suitable space. The Government Plantations comprise some 16,000 acres and are fairly well distributed over the country. Like the country in general, however, the really good soils and positions are already occupied by permanent crops. There is much land available, but it is in general not of the best.

During the year a considerable sum of money (Rs. 20,000) was spent upon clearing areas of land in both Zanzibar and Pemba which were not carrying a remunerative complement of cloves or coconuts, but where the soil appeared to be reasonably good, and in laying out and planting a variety of crops, permanent and annual, for the purpose of preliminary trial. At one centre the area cleared amounted to 50 acres and has provided sufficient space for some economic data to be obtained if the plantings are successful.

Extensive nurseries have been erected and the budding of citrus fruits has received considerable attention as the production of oranges has long been a small side-line in the Island. In addition to bud-grafting of selected local bud-wood upon rough lemon and sour orange stocks raised in the nurseries, a selection of young plants of well-known varieties of orange and grape fruit were imported from South Africa.

Although Zanzibar oranges enjoy a good reputation in East Africa it must be remembered that there are many factors to be taken into consideration when placing fruit on a foreign market, and our local criteria in judging may lead us to place too high a value upon the merits of our products.

One report from the Empire Marketing Board upon a consignment of oranges sent to London by the department as a marketing experiment surmised that the "orange groves" would appear to be poorly cultivated. The point is, of course, that orange trees occur accidentally in the neighbourhood of plantation dwellings and are entirely neglected. There is no cultivation, no pruning and no spraying. Half a page of the report gives the names of the principal parasites found on the selected fruit sent home.

The citrus fruit market is a very particular one and insists upon produce being standardised in every way. Zanzibar's citrus stock-in-trade consists of a large number of scattered seedling trees of vastly different merit. There is no single grower who has enough fruit of one kind to make a consignment. To obtain 2,000 oranges fit to export the department had to buy 6,000, even when some precautions had been taken to explain what was required and what would be useless.

We know that in Zanzibar oranges grow very well and that sweet and juicy fruit can be produced. It is also apparent that there is not

at the present time the basis upon which a large export trade could be built up—that is a trade beyond the limits of East Africa.

When one reflects upon the quality of copra produced and the general carelessness in the handling of cloves the question arises whether the citrus industry, which requires such constant attention to the trees and so much supervision over the picking and handling of the fruit, is really quite adapted to the genius of the bulk of the people of the country.

The propagation of good varieties of budded stock is, however, very desirable. The existing stock of trees will gradually be replaced by those propagated from the best local and most successful imported individuals. The export of citrus fruit on a large scale to Overseas markets must await the development of more satisfactory methods in production, although private enterprise may even at the present time find a profit in sending carefully selected good quality fruit to Aden and Port Sudan, where a gross return to the producer of about Rs. 13 per thousand oranges has been obtained.

Similarly experimental consignments of pineapples have been sent to the Empire Marketing Board. With care in packing the fruit can be landed in the market in good condition. The large Zanzibar pines, of Smooth Cayenne variety, which are much prized locally, do not appear to meet the requirements of the English market, being too large and of unattractive colouring. Opinions differed as to their value, merchants quoting from 1s. 6d. each up to 3s. or 4s. There would be no profit at the former figure. The Empire Marketing Board Experimental Consignments, Report No. 7., publishes the results of these experiments and further information can be obtained from the Department of Agriculture.

Further experiments were conducted in the drying of cloves, both in the plantation and the laboratory. It was thought that trays of perforated zinc, fitted with handles and short legs, would bring about the rapid drying of cloves and enable convenient handling and stacking of the trays in the event of rain. This experiment proved a failure as the cloves took much longer to dry on these trays than on the ordinary cement barbecue or “Sikafu” as it is locally called. Not only was there a waste of time but, as is always the case with slow drying, the colour of the final product was far too dark. In this connection it may be remarked that there is a considerable difference in the time of drying and colour of the product between the cement drying floor and the palm mats so generally used by the smaller producers. This fact does not seem to be universally known among clove producers, as I have recently had occasion to expostulate with an Arab who had purchased the crop on a Government plantation where there is a large cement drying floor because he was spreading mats on this floor to dry his cloves. He had evidently been accustomed to mats and declined to accept any advice in the matter. He will lose about half a rupee per frasila on a crop of perhaps 2,000 fraslas.

The second plantation experiment in clove drying was to utilise the underground-fire copra kiln at Selem plantation. Perfectly dry cloves of excellent colour were obtained in $21\frac{1}{2}$ days. This method of drying cannot compete with sun-drying from the point of view of cost. Moreover it requires constant attention and intelligence in regulating the firing. Manipulated with the amount of care usually bestowed upon copra-kilns the owner would be ruined in one season, and there are few overseers on Government Plantations who could be trusted to supervise the process. Rain will reduce the price of cloves through spoiling the colour; fire would quickly render them utterly valueless; nothing but a guaranteed fool-proof fire-heated dryer should be attempted by plantation owners.

In the laboratory an experiment was made to compare the oil content of artificially-dried cloves with that of cloves sun-dried on a cement floor. Cloves from the same bulk were dried both ways and it was found possible with a well-ventilated electrically-heated oven, the temperature of which could be kept constant at any desired degree, to produce a dry fine-coloured sample without loss of oil—actually in the experiment the artificially-dried sample contained an amount of oil slightly above that in the sun-dried sample.

I do not anticipate that any artificial method can displace ordinary sun-drying, but a plant for conditioning or finishing off material when adverse weather conditions have rendered secondary treatment necessary would seem to be a very desirable equipment for large plantation owners and dealers in cloves to possess. There might also be centres at which the Clove Growers' Association could deal with the produce of its members. The matter has been discussed privately with drying engineers, and Mr. Barnes drew the attention of the Institute of Chemical Engineers to the subject at the last Annual Conference of that body. Since then the matter has been placed before the Imperial Institute and a number of the leading firms manufacturing drying plant, and the merits of different systems will be compared.

Section VII.

MISCELLANEOUS.

The Agricultural Department is in this country very largely occupied in providing financial assistance to plantation owners as Table I in the Appendix will indicate. Other routine work consists of the inspection of plantations in connection with the Plantation Preservation Decree which enables the department to require agriculturists to do such cleaning and cultivation as shall prevent the spread of fire, pests and disease. The same inspectorate staff is employed in checking returns of trees and plantings which have hitherto been subject to bonus payments. As has been stated already all bonuses

have now been abolished. During the year 1928, this plantation inspection work may be summarised as follows:—

	Plantations inspected.	Bearing trees checked.	Young trees checked.	Young trees sealed.
Zanzibar	1,697	73,270	—	1,839
Pemba	1,392	27,134	44,206	24,629
	—	—	—	—
Total	3,089	100,404	44,206	26,468
	—	—	—	—

Agricultural Officers and the subordinate staff have also been engaged in the examination of cloves under the Agricultural Produce (Export) Decree (1929). In 1928 there was considerable activity both in Pemba and Zanzibar under the Agricultural Produce (Adulteration) Decree (1927), the object of which was precisely the same as that of the new decree which has repealed the latter. It was found that there were flaws in the legislation of 1927 and the whole procedure was altered, inspection being confined to cloves actually passing through the Customs for export with no control being exercised at any other point.

Both decrees were successful in bringing about a great improvement in the quality of our principal produce. The present decree, by ensuring the examination of every consignment, has undoubtedly been more effective than the earlier effort. There can be little doubt that the greatly improved quality of the cloves now being exported is encouraging buying in the overseas markets, as merchants know when they buy cloves that there will not be more than 16 per cent moisture in them and that in consequence the shrinkage on long storing will not be as great as formerly.

In the 1927-28 season two agricultural officers devoted almost their entire attention to this work. The new decree has lessened the work, one officer alone being employed in the inspection and finding opportunities to give some attention to experimental work in addition. The Assistant Government Chemist has also been considerably relieved in the analytical examination of samples, as the exporters rarely bring cloves for export which are below the standard. There may be trouble during the rainy season, but up to the present the decree has operated more smoothly than had been generally considered possible.

Section VIII.

GOVERNMENT PLANTATIONS.

The year has shown the advantage of the surveys which for the past three years have been progressing. It is not so much the demarcation of the boundaries which is of importance as the internal planning of the blocks of cultivation. Without such plans it is impossible to keep proper records of work done or to arrive at the cost of various operations. Even with complete plans the work of efficient supervision

and control over 16,000 acres would be an almost superhuman achievement by a single Manager such as is provided; without such plans heavy financial losses are inevitable.

It is pleasing to record that the net profits for the year—cash paid into the Treasury in excess of all expenses—amounted to one and a quarter lakhs of rupees, say £9,300, in spite of it having been in many ways a poor year. The Manager of Plantations quite rightly maintains that experimental work carried out on Government plantations must not be a charge on the business. He has, however, been sufficiently generous to forego rent for land so occupied!

With the near approach to completion of the surveys it will shortly be possible to draw up working plans for the future development of these estates. Whether that development will be carried out by Government or by private enterprise will depend upon the land market. It is quite probable that Government will have to continue the management and development of the greater part at any rate, and as demonstrations in regeneration are of vital importance to the country it is not altogether a matter for regret that there is no pressing demand for plantation land by the agricultural classes in these islands.

The Government Plantations have undergone much more replanting than the generality in the country and the proportion of trees under 10 years of age to that of fully bearing trees would give the impression that regeneration was fairly efficient on our plantations. There are at the present time 29,500 clove trees under 10 years of age on the Government Zanzibar plantations. The census of old trees is not yet complete, but the last count, about 2 years ago, gave 111,000 bearing trees on these particular plantations. The stock under 10 years of age is therefore 21 per cent of the total. If the economic age of the clove tree be taken at 60 years there should be 16 per cent of the trees under ten years of age on a plantation. The unfortunate fact is that a very large proportion of our young plants are not developing into good trees owing to the adverse effect upon them of the shade from the adjacent old trees. The young stock is very disappointing in quality though adequate in quantity. Clear felling and systematic regeneration will be started at the end of the 1929-30 harvest on one plantation at least—funds are not available for the inauguration of the system generally. It is not yet possible to estimate the expenses in connection therewith until one large block has been dealt with. For a period it is inevitable that expenses will increase and revenue decrease and this must be borne in mind in future estimates.

The Annual Report of the Manager of Plantations appears in the following pages.

REPORT ON ZANZIBAR GOVERNMENT PLANTATIONS, 1928.

The past year, as regards the working of the Government lands, or estates, is the first one during which an attempt has been made to keep a fully detailed account of expenditure and work under

various headings. This was initiated during the second half of the previous year, but time was needed to make the plantation staff, in most cases not too intelligent or anxious to learn, understand and try to follow the general idea of and necessity for rendering accounts of money spent and work done.

The total expenditure on cultivation amounts to Rs. 1,09,411-51 cts. for the year, divided into:—

	Rs.	Cts.	Rs.	Cts.
1. Maintenance of bearing areas	50,418	95		
2. Maintenance and Development of non-bearing areas	24,146	47		
3. Clove Harvest (Estate labour)	1,306	45		
4. Copra Harvest (Estate labour)	3,699	13		
5. Contingencies—Roads, Houses, etc.	5,250	91		
6. Experimental	20,569	98		
7. Departmental expenses (Public Nurseries)	4,019	62		
			1,09,411	51
Add to the above:—				
8. Personal Emoluments (Manager and Permanent staff)	45,089	99		
9. Labour for Clove picking and drying	16,457	71		
10. Labour for Coconut gathering and Copra Factories	16,656	96		
11. Travelling and Transport	10,900	82		
12. Incidental expenses	118	45		
13. Materials and Tools, Seeds, Manures, etc.	9,758	98		
14. Repairs to Plantation Houses and Copra Factories	5,616	22		
15. Survey of Government Plantations	6,990	27		
			1,11,589	40
Total Expenditure Rs.				2,21,000 91

Items 1 and 2 are subdivided into upkeep of clove and coconut areas and development as follows:—

	Rs.	Cts.		Rs.	Cts.
1. (a) Maintenance of bearing Cloves	21,860	11			
(b) Maintenance and Development of non-bearing Cloves	9,509	73			
2. (a) Maintenance of bearing Coconuts	28,558	84			
(b) Maintenance and Development of non-bearing Coconuts	14,636	74			
REVENUE.					
1. From Cloves				1,32,607	61
2. From Coconuts				1,82,302	14
3. From Miscellaneous				5,744	67
Total Revenue Rs.				3,20,654	42

Thus the total profit is, not taking into account the money spent on experimental and departmental work, Rs. 1,24,243-11 cts.

Owing to the lightness of the clove harvest, the maintenance of bearing areas was confined to slashing in order to keep down the cost, except at Selem where the tractor was at work and disc-harrowing carried out. So far as at present observed the change from hoeing to slashing has not affected the bearing capacity of the trees. But it must be remembered that the type of hoeing in vogue could by no stretch of the imagination be considered satisfactory. However, the question of cost is the main deciding factor.

THE STOCK OF CLOVE AND COCONUT PALMS.

The following numbers of deaths of bearing trees have occurred during the year:—

Cloves	915
Coconuts	334

As regards cloves the gaps made by the deaths of old trees are not replanted since experience shows that leggy saplings result from doing so, unless the vacant plot to be replanted is a large one. It is doubtful if areas exist on Government lands still unplanted which will grow cloves profitably.

The losses from death amongst old coconuts are more than balanced by the new plantings.

On areas previously planted up with cloves or coconuts replantings were made as follows:—

Cloves	3,600
Coconuts	3,800

and 3,195 young coconuts were planted on land cleared of bush during the year. In all cases the land carried a heavy stand of secondary scrub, which is the most expensive of all to clear.

Regarding the stock figures it was pointed out in the report for 1927 that a new census is advisable, but that it should not be carried out until the completion of the new surveys made in accordance with the plan described in that report. This work, starting on the Kizimbani Estate, has only recently been taken in hand again owing to the Surveyor being required to carry out other tasks, in most cases due to the impending sale of various lands, and encroachment on the Ngezi Forest in Pemba requiring his attention. Thus the census still awaits completion, but at the time of going to press the enumeration of clove trees in various groups up to 10 years of age has been completed for Zanzibar and appears in this Report (Table A).

SURVEYS.

During the year the Surveyor has completed work according to the attached programme (Table B) at a total cost of Rs. 6,990-27 (which shows as Re. 0-76 per acre surveyed). The total area demarcated to date equals 12,412 acres, and for the current year 9,187 acres; it is estimated that another 4,000 acres remains to be so treated, mainly in Pemba.

It is hoped, however, that the detailed survey of the Kizimbani Estate will be completed before further areas are dealt with, since further economies in working depend largely on the information to be obtained from the plans so produced.

TRACTOR.

The tractor was at work for 196 days out of the 366, and dealt with a total of about 800 acres, an average of 4 acres a day, at a cost of Rs. 1,604.54 or Rs. 2 per acre, against Rs. 4.25 for hand hoeing. The cost per acre will vary according to the nature of the land cultivated and the degree to which it is desired to cultivate. Thus if it is desired to discourage a rank stand of lalang or to reduce hard ground to a good tilth then the cost mounts, but if it is required merely to keep down the ordinary weeds then of course the cost can be reduced according to the height and thickness of the growth.

There is no doubt that the work performed is of first-rate quality, particularly noticeable when dealing with the pernicious and hardy lalang which gets a considerable set back when thoroughly harrowed. Even when repeated cross-harrowing raises the cost per acre above that of hand-hoeing, the money is well spent and the lasting quality of the work is very apparent.

A gang had to be employed in connection with the working of the tractor in clearing up and burning coconut logs, etc., and it was found to be necessary to keep a hand at work clearing away fallen coconut leaves from the ground amongst coconut palms, which would otherwise clog the discs and throw them into the air.

The outfit would be ideal for working-in leguminous cover crops.

In addition to the experimental plantings at Kinaoni, small plots of cacao were put in at Mahonda and Chumbuni Mtoni. The former, in spite of lack of shade or very much attention, has come away well; the latter is not a success, probably because the ground is too stiff and heavy.

A half-acre plot was planted up with Alfalfa at Chumbuni, as a trial catch crop for fodder. The growth is poor, due to low elevation and periods of drought. Experiments have been carried out to ascertain details connected with the cost of fallen clove leaf collection with a view to distillation, but without a baling press it was found that transport charges were prohibitive, though collecting charges were low, varying with the conditions under which the leaves were collected, i.e. from clear ground carrying masses of leaves to a sparse covering amongst a growth of weeds.

With reference to clearing bush we experimented with a Monkey Jack, the property of an Indian merchant, but it is considered that, in a country where comparatively cheap labour is available, it is cheaper to dig out the roots by hand since the manipulation of the Jack takes up too much time and labour for the results obtained.

NURSERIES.

Fourteen thousand and five hundred clove seedlings were issued free to land owners from the nurseries maintained on the properties, and 13,800 coconut seedlings sold from the same source. By the

end of the year 20,000 clove seedlings and 28,000 coconut seedlings were laid down in readiness for sale, issue or for development. The total cost of maintenance and formation was Rs. 4,019-62 cts.

COPRA.

The details of expenditure and revenue from the four operated coconut plantations are shown herewith (Table C).

The number of bearing palms, that is those shown as picked, on the operated plantations shows a percentage of 65.52 of the number of mature palms shown on the stock returns; i.e. some 35 per cent of the mature trees are not regularly bearing. It is impossible to obtain similar figures from the leased properties, but it may be assumed that a similar proportion holds good.

The accompanying table (Table D) shows the nuts gathered per palm for each group of plantations, calculated on the basis of mature palms as recorded in the stock returns.

On Selem division experiments were carried out with kiln-drying of the copra. Two types of kiln were made, one under ground and one above ground; the costs were similar—about Rs. 120 per kiln including the shed—and results about equal. The only question is therefore one of fuel consumption. This must be given further trials.

The labour has sufficed in quantity if not in quality. The standard of work rendered is poor when compared with that obtained in other countries, partly due to bad supervision and local custom.

I should like to mention the great assistance rendered throughout the year by Sheikh Mohammed bin Seif bin Salim el-Busaidi, who has ever been willing to carry out most efficiently all requests made to him

GRAHAM TOMSON.

Manager of Plantations

TABLE A.

STATE OF YOUNG CLOVE TREES ON GOVERNMENT PLANTATIONS.

1ST SEPTEMBER, 1929.

Estate and Division.	I	II	III	Total.
	3 year.	4 - 6 year.	7 - 10 year.	
SELEM.				
Mahonda	840	—	189	1,029
Selem	—	929	409	1,338
Mbaleni I	673	—	218	891
Mbaleni II	150	73	28	251
Kitope	1,000	39	18	1,057
	—	—	—	—
Total	2,663	1,041	862	4,566
	—	—	—	—
MACHUI.				
Manyame	38	113	416	567
El-Hathra	113	236	1,455	1,804
Marseilles	91	156	1,582	1,829
Darajani	275	29	396	700
Basra	95	77	417	589
Kitumba	158	485	27	670
Kinaoni	68	285	22	375
Koani	101	95	51	247
Dunga	35	104	155	294
	—	—	—	—
Total	974	1,580	4,521	7,075
	—	—	—	—
KIZIMBANI.				
Kizimbani	301	603	602	1,506
Mlangoni	593	1,162	2,742	4,497
Kinuni Moshi	5	103	246	354
Kidichi	276	16	67	359
Kinuni Mdo	6	—	31	37
Bumbwi Sudi	63	110	147	320
Kipange	123	304	371	798
Mkanyageni	573	72	520	1,165
	—	—	—	—
Total	1,940	2,370	4,706	9,026
	—	—	—	—
Dole	4,718	889	51	5,658
Masingini	1,915	1,050	—	2,965
	—	—	—	—
Total	6,633	1,939	51	8,623
	—	—	—	—
MTONI				
Mgongowangania	189	52	—	241

SUMMARY

	I	II	III	
	3 year.	4 6 year.	7 - 10 year.	Total.
Selem Estate	2,663	1,041	862	4,566
Machui Estate	974	1,580	4,521	7,075
Kizimbani Estate	1,940	2,370	4,706	9,026
Dole and Masingini	6,633	1,939	51	8,623
Mtoni Estate	189	52	—	241
	<hr/>	<hr/>	<hr/>	<hr/>
Total	12,399	6,982	10,140	29,521
	<hr/>	<hr/>	<hr/>	<hr/>

TABLE B.

SURVEYS, 1928.

Nature of work.	Shamba.	Area.
Traverse and Planetable	Mkanyageni	217 acres
Traverse	Kizimbani	489 „
Traverse and Planetable	Mlangoni	437 „
Cutting sub-divisions and Traverse and Planetable	Kipange	154 „
„ „	Kinuni Moshi	741 „
„ „	Bumbwi Sudi	328 „
„ „	Mdo	235 „
„ „	Kidichi	545 „
Traverse and Planetable	Kinaoni	664 „
Traverse	Ngezi Forest (Pemba)	3,160
„	Makondeni (Pemba)	140 „
„	Tundana (Pemba)	445 „
„	Mahonda	566
„	Mbaleni Ndogo	96 „
„	Mbaleni Kubwa	258 „
„	Kitope	712 „
		<hr/>
	Total	9,187 „
		<hr/>

TABLE D.

COCONUT CROP, 1928.

Estate.	Mature trees.	Crop of Nuts.	Average Nuts per tree.
Marseilles	56,269	15,75,932	28.01
Selem	38,955	8,57,581	22.01
Chukwani	18,307	3,33,369	23.67
Mtoni	22,655	5,82,866	25.73
Kizimbani	32,494	9,64,013	29.67
Total	1,68,680	44,13,761	26.17

Section IX.

CHEMICAL BRANCH.

The functions of the Government Chemist lie to a considerable extent outside the scope of the Department of Agriculture, and the Report of the Assistant Government Chemist, who is the responsible executive officer in this branch of work, is presented herewith.

Activity under the old Agricultural Produce (Adulteration) Decree ceased early in the year, and the analysis of samples of cloves submitted by the Inspectors was therefore much less than in the previous year.

This relief enabled the Chemist to devote some time to the problems of copra and clove drying. Just as chemical investigations had to precede the establishment of standards for clove exports, so now experimentation has been made to enable standards to be adopted in regard to copra.

Detailed experiments were made upon the rate of drying under different conditions, and further work is in progress upon the quantity and composition of the meat obtained from nuts at different stages of maturity.

The Chemical laboratory will be ready to indicate standards of quality and equipped to deal with the administration of any legislation which may in the future be considered necessary to bring about an improvement in the quality of our extensive exports of copra.

REPORT OF THE GOVERNMENT CHEMICAL LABORATORY

FOR THE YEAR 1928.

1. STAFF.

The Assistant Government Chemist was on leave until 19th February, and Mr. A. C. Barnes continued to do the work of the Laboratory until that date.

2. CHEMICAL WORK.

During the first quarter of the year routine examinations of cloves in Customs were continued, but the Agricultural Produce (Adulteration) Decree having been found faulty, examinations were then suspended, pending the introduction of amending legislation. This accounts for a very large reduction in the number of samples dealt with as compared with the previous year. This reduction in routine work enabled several interesting investigations to be undertaken, reference to which is made later.

The total number of samples received was 423, compared with 1,172 in 1927.

These samples were received from departments of the Government and other sources as shown in Table I.

TABLE I.

Department.	1st Qr.	2nd Qr.	3rd Qr.	4th Qr.	Total.
Agriculture	118	48	11	10	187
Health	28	31	27	26	112
Police	5	2	7	5	19
Customs	22	27	7	20	76
Other Departments	3	5	2	—	10
Total Government	176	113	54	61	404
Private samples	13	1	5	—	19
Total	189	114	59	61	423

A decision was reached that the Laboratory might undertake a limited amount of work for private firms or individuals, and a scale of fees payable to Government was adopted. A remission of such fees is permitted when the results of the examinations are of general interest and are made available for the use of the public. A total of Rs. 130 was received in fees.

The details of Government samples are as follows:—

Agriculture.—Cloves, 149; clove leaves, 3; green cloves, 1; copra, 17; fertilizers, 3; soils, 8; other specimens, 6; Total, 187.

Health.—Soda water, 66; cattle dips, 14; water, 6; medicines, 17; other samples, 9; Total, 112.

Police.—Spirits and other alcoholic liquids, 4; exhibits for opium, bhang, etc., 13; toxicological exhibits, 1; other samples, 1; Total, 19.

Customs.—Spirits, perfumes, essences, etc., 51; medicines for opiates and dangerous drugs, 16; condensed milk, 8; other samples, 1; Total, 76.

Other Departments.—Total, 10.

NOTES.

(i) *Agriculture.*—Of the 149 samples of cloves, 12 were examined for foreign matter and “khoker” only and 134 for moisture only; the remaining three samples were in connection with a special investigation.

Of the 12 samples examined for foreign matter, all contained less than 5 per cent judged on ordinary standards; “khoker” varied from 1.3 to 15.4 per cent.

Of the 134 samples tested for moisture, 31 were passed (16 per cent or less) and the remainder contained moisture above the limit as follows:—16.1-17 per cent, 25; 17.1-18 per cent, 25; 18.1-19 per cent, 30; 19.1-20 per cent, 14; 20.1-21 per cent, 3; 21.1-22 per cent, 2; over 22 per cent, 4, the highest figure being 23.5 per cent.

Investigations conducted during the year included one on the drying of copra, which indicated an original moisture content of 50 to 55 per cent and a final content in the sun-dried product of 8.5 to 9 per cent. Tests were also made on copra produced on Government plantations. Five samples of sun-dried averaged 9.0 per cent moisture, the limits being 7.6 per cent and 9.6 per cent; six samples of kiln-dried copra varied between 8.0 per cent and 9.4 per cent, the average being 8.6 per cent. Two samples of locally marketed copra gave 22.3 per cent and 17.4 per cent moisture respectively; the latter was described as “fair average quality”. The Brown-Duvel test, slightly modified, was used in these estimations.

Experiments were made on the proposed “denaturing” of cloves for export to vanillin manufacturers, and led to its abandonment.

It is sometimes found that the percentage oil content of “Khoker” is higher than that of good cloves. A percolation experiment showed that water, by extracting a greater proportion of solid matter than of oil from cloves, may increase the percentage content of oil in the final product; the weight of khoker is, however, considerably less than that of a corresponding number of good cloves, and the actual weight of oil obtained from a given picking is diminished by bad handling and exposure to rain, etc.

Preliminary experiments were made on the distillation of green (un-dried) cloves, and of cloves dried by artificial heat and in the sun. The present indications are that the oil from un-dried cloves has a rather higher eugenol content and a finer aroma than the oil obtained from dried cloves. It was also shown that cloves of excellent appearance and aroma could be produced by low-temperature artificial drying, with no appreciable loss in quantity or quality of oil. These experiments will be extended during the next clove harvest.

In connection with trial shipments of citrus fruits which have been made by this Department, considerable quantities of ethylene

gas were prepared in the laboratory, and used for the stimulation of the colouring process in oranges and grape-fruit. This is a standard procedure in certain fruit-producing countries, and the results here were promising.

A quantity of ylang-ylang oil distilled from flowers gathered at Migombani and elsewhere was submitted for commercial evaluation. Dr. Klabers, of New York, to whom a sample was submitted by the trade, reported the following figures:—

“Specific gravity at 15°C.	0.990
Optical rotation	—27°34'
Saponification value	168.4

The oil is soluble in 1 volume 80 per cent alcohol with slight opalescence; cloudy with more.”

These figures correspond closely with some published figures for oil from Mauritius, but our sample was regarded by the American market as of unusual composition.

(ii) *Health*.—Several examinations of food-stuffs were undertaken to determine their suitability for use in the diets of diabetic patients.

In the stomach contents of a person found unconscious a small quantity of alcohol was found, but no other drugs.

Two samples of *Ol. Chenopodii* and one each of carbon tetrachloride and liquid paraffin were examined for purity in connection with their use in the treatment of ankylostomiasis.

Strychnine was detected in an imported medicine, submitted by the Postmaster through the Deputy Director of Medical and Sanitary Services. In twelve other medicines no dangerous drugs were found.

A sample of ghee was examined as to its fitness to form the basic fat of the diet of the prisoners in the Government Prison.

Routine tests were conducted of soda waters and of cattle dipping fluids. The strength of the latter was generally quite satisfactory.

Water samples from Zanzibar Town, Mkoani, Mbweni and Mkokotoni (2) were submitted for chemical analysis. As usual, the results so obtained were correlated with the results of bacteriological tests made in the laboratory of the Health Department, in forming a final opinion. A sample of water from the stand-pipe from which water is supplied to ships in the Harbour was tested, and proved of excellent quality. It was learnt later that the brackishness of which complaints had been received was traced to a source other than Zanzibar.

(iii) *Police*.—Opium was detected in 8 out of 9 exhibits, and bhang in 3 out of 4. One exhibit which had caused symptoms of poisoning was found to consist of hydrochloric acid and linseed oil. Alcohol was detected in four liquids sent in. One exhibit proved to be potassium nitrate.

(iv) *Customs*.—All the samples of condensed milk (8) were found to contain a satisfactory percentage of fat, varying from 8 per cent to 9.5 per cent.

The liquids examined for excise purposes included 2 spirits, 5 liqueurs, 16 essences, and 9 perfumes, all of which were alcoholic; 2 colouring preparations, 10 perfumes, 3 syrups, etc. were passed as non-alcoholic.

The 17 medicines examined under the Dangerous Drugs Decree, 1927, were found free from Dangerous Drugs.

(v) *Other Departments.*—For the Electricity and Railway Department three samples of boiler-feed water were examined, and three of distilled water.

A thermometer was tested for the Port and Marine Department, and a standard “pishi” measure for the Senior Commissioner. The Chief Secretary submitted a sample of very pure synthetic vanillin prepared from guaiacol by a German firm.

Other materials dealt with were prickly pear leaves and creek mud, and for the Harbour Works a specimen of felt packing which was suspected of having caused corrosion of corrugated iron sheets.

For the Museum a cement was prepared which proved satisfactory for the repair of broken non-inflammable cinematograph films.

During the year 131 written reports were sent out, mainly to Departments other than the Agricultural.

3. MISCELLANEOUS WORK.

Library.—The departmental library has been re-organized, and a card-index is being built up of references to all crops, pests, diseases, fertilizers, etc., in which Zanzibar is interested, and to literature on marketing, agricultural co-operation, etc.

The Assistant Government Chemist acts as librarian.

Exhibitions.—In connection with the first Annual Conference of the Clove Growers' Association an exhibition of cloves, copra and their products was arranged at the Victoria Gardens. The process of distilling clove oil was demonstrated, and by means of specimens the relative oil content of cloves, stems and leaves was illustrated. The exhibits bore explanatory labels in English and Arabic and attracted much attention from the delegates and the general public.

An exhibit of the chief agricultural products of the Protectorate and of articles manufactured therefrom, together with numerous photographs of agricultural and other subjects, and graphs of production and trade, was arranged and forwarded for the Territorial Exhibit Section of the Eastern African Agricultural Show held at Nairobi in October. It is reported to have attracted considerable attention.

Meteorology.—A Campbell-Stokes sunshine recorder has been fixed on the roof of the Government Offices, and returns of sunshine are now published with the other meteorological observations. Standard and automatic (Hyetograph) rain-gauges have also been fixed. The hyetograph gives interesting records of the amount and duration of individual showers.

L. W. RAYMOND,

Assistant Government Chemist.

Zanzibar, 23rd January, 1929.

APPENDIX

TABLE IA.

ASSISTANCE TO CLOVE GROWERS.

	Zanzibar.	Pemba.	Total
(a) Loans for Harvesting.			
Number of loans	61	2	63
Amount of loans	12,461	1,300	13,761
(b) Free Storage of Cloves			
Number of advances	3	92	95
Amount of advances	3,150	54,268	57,418
(c) Bonus Payments.			
On bearing trees	1,78,994	3,05,484	4,84,478
On young trees	17,236	96,735	1,13,971
(d) Produce Sold through the Clove Growers' Association.			
	Cloves.	Stems.	Copra.
	Frs. lbs.	Frs. lbs.	Frs. lbs.
Zanzibar produce	7,680 18	712 06	188 08
Pemba produce	5,345 33	5 11	48 21
	<hr/>	<hr/>	<hr/>
Totals	13,026 16	717 17	236 29
	<hr/>	<hr/>	<hr/>

TABLE IB.

ZANZIBAR AND PEMBA CLOVE GROWERS' ASSOCIATION.

RECEIPTS AND PAYMENTS ACCOUNT.

1st November, 1927 to 31st December, 1928.

[illegible][illegible]

TABLE Ic.
ZANZIBAR AND PEMBA CLOVE GROWERS' ASSOCIATION.

Statement of Assets and Liabilities on 31st December, 1928.

LIABILITIES.		ASSETS.	
Loans from Government:—		Cash in hand—Zanzibar	Rs. 2,025.94
Zanzibar	Rs. 10,000.00	Pemba	3,000.00
Pemba	3,000.00		
			5,025.94
Lorries:—	13,000.00	Lorries:—	
Balance of Purchase Price		Cost	6,570.00
Insurance	6,070.00	Less 20% Depreciation	1,314.00
Materials	4 0.81		
	252.50	Loans Outstanding:—	5,256.00
		Zanzibar	9,430.00
		Pemba	300.00
			9,730.00
Sundry Accounts outstanding		Sundry Accounts outstanding	56.87
Excess of Assets over Liabilities		Stores on hand	36.09
	Rs. 20,104.90		Rs. 20,104.90

TABLE II.

Clove deliveries compared with former seasons

(in frassas of 35 lbs.)

Month	1923/4.			1924/5.		
	Zanzibar.	Pemba.	Total.	Zanzibar.	Pemba.	Total.
July	7,636	26,840	34,476	341	2,721	3,062
August	4,100	17,968	22,068	2,235	26,409	28,644
September	7,764	31,980	39,744	23,358	88,072	111,430
October	6,197	39,771	45,968	43,968	90,716	134,684
November	4,960	43,663	48,623	43,274	74,445	117,719
December	2,447	19,228	21,675	54,090	51,365	105,455
January	13,933	15,037	28,970	43,641	49,239	92,880
February	17,454	13,532	30,986	11,264	41,348	52,612
March	6,184	12,904	19,088	9,439	32,107	41,546
April	2,923	5,680	8,603	2,933	23,259	26,192
May	1,044	3,308	4,352	4,304	19,222	23,526
June	385	6,856	7,241	2,105	21,587	23,692
Total	75,027	236,767	311,794	240,952	520,490	761,442

Month.	1925/6.			1926/7.		
	Zanzibar.	Pemba.	Total.	Zanzibar.	Pemba.	Total.
July	5,596	15,445	21,041	19,796	11,352	31,148
August	9,366	40,711	50,077	16,357	15,445	31,802
September	42,162	88,069	130,231	5,370	30,610	35,980
October	67,918	80,357	148,275	5,827	39,277	45,104
November	38,215	44,699	82,914	3,371	39,933	43,304
December	27,531	48,615	76,146	17,162	56,803	73,965
January	10,759	5,852	16,611	62,506	102,327	164,833
February	5,814	20,267	26,081	41,465	91,589	133,054
March	2,322	16,617	18,939	18,063	54,888	72,951
April	1,291	13,647	14,938	5,858	32,590	38,348
May	2,186	10,639	12,825	6,080	33,095	39,175
June	6,032	7,704	13,736	2,088	21,277	23,365
Total	219,192	392,622	611,814	203,843	529,186	733,029

Month.	1927/8.			1928/9.		
	Zanzibar.	Pemba.	Total.	Zanzibar.	Pemba.	Total.
July	3,228	16,907	20,135	8,576	13,336	21,912
August	10,138	16,243	26,381	4,034	21,224	25,308
September	8,165	19,493	27,658	3,512	20,276	23,788
October	18,255	45,755	64,010	2,934	20,544	23,528
November	21,096	78,121	99,217	1,268	11,808	13,076
December	19,937	76,253	96,190	7,152	12,276	19,428
January	53,101	90,984	144,085	22,764	11,708	34,472
February	33,284	61,132	94,416	7,560	5,248	12,808
March	11,242	30,956	42,198	4,996	2,436	7,432
April	6,211	29,713	35,924	11,444	1,776	13,220
May	2,453	14,719	17,172	200	3,828	4,028
June	3,260	20,106	23,366	288	1,280	1,568
Total	190,370	500,332	690,752	74,828	125,740	200,568

TABLE III.

Protectorate clove crops for the past 33 seasons:—

Season.	Zanzibar.	Pemba.	Total.
	Fras.	Fras.	Fras.
1896/97	86,000	224,000	310,000
1897/98	48,000	157,000	205,000
1898/99	145,000	466,000	611,000
1899/1900	64,000	221,000	285,000
1900/01	37,000	200,000	237,000
1901/02	44,000	323,000	367,000
1902/03	172,000	252,000	424,000
1903/04	27,000	99,000	126,000
1904/05	81,000	654,000	735,000
1905/06	178,435	129,735	308,170
1906/07	63,004	203,496	266,500
1907/08	213,662	541,993	755,655
1908/09	165,727	449,691	615,418
1909/10	109,678	300,047	409,725
1910/11	52,100	139,307	191,407
1911/12	216,507	582,153	798,660
1912/13	31,018	104,368	135,386
1913/14	145,586	638,094	783,680
1914/15	194,920	331,389	526,309
1915/16	141,641	655,116	796,757
1916/17	208,716	302,919	511,635
1917/18	63,958	234,239	298,197
1918/19	259,273	565,229	824,502
1919/20	93,847	168,703	262,550
1920/21	231,831	316,446	548,277
1921/22	65,819	200,983	266,802
1922/23	231,417	690,498	981,915
1923/24	75,027	236,767	311,794
1924/25	240,952	520,490	761,442
1925/26	219,192	392,622	611,814
1926/27	203,843	529,186	733,029
1927/28	190,370	500,382	690,752
1928/29	74,828	125,740	200,568
<hr/>			
Average 33 seasons	135,011	347,139	482,150
<hr/>			

TABLE IV.

Annual Clove Exports, Pemba.

Year.	W ETI DISTRICT.					CHAKE-CHAKE DISTRICT.			M KOANI DISTRICT.					Total PEMBA.		
	Weti.		Mtambwe.	Junguni.	Kipangani. (Matangani- twani)	Msuka.	District Total.	Chake.	Kiswani.	District Total.	Jamban- gone.	Mkoani.	Fufuni.		Kengeja.	District Total.
	Fs.	Fs.	Fs.	Fs.	Fs.	Fs.	Fs.	Fs.	Fs.	Fs.	Fs.	Fs.	Fs.		Fs.	Fs.
1914	88,433	13,786	5,721	8,666	6,594	1,23,200	85,779	23,550	1,03,329	45,043	13,988	16,947	21,826	91,804	3,24,333	
1915	1,64,655	25,072	12,992	21,738	11,126	2,35,583	1,46,913	46,330	1,93,243	79,069	26,732	40,228	46,693	1,92,722	6,21,548	
1916	1,17,387	26,709	12,168	7,305	5,950	1,69,519	81,807	28,707	1,13,514	62,931	14,788	22,144	42,279	1,42,112	4,25,175	
1917	20,951	12,135	5,248	7,893	4,449	50,611	23,096	8,011	31,107	3,114	4,654	12,010	10,450	50,625	1,32,346	
1918	76,309	17,786	15,555	10,503	5,429	1,25,582	1,25,634	16,032	1,41,666	74,253	28,153	16,583	37,815	1,50,804	4,18,052	
1919	1,40,562	18,810	10,269	7,427	5,763	1,82,831	77,261	28,463	1,05,724	51,370	16,964	13,876	26,807	1,09,017	3,97,372	
1920	31,674	3,304	1,010	1,001	4,874	41,863	50,311	5,499	35,810	16,433	2,096	6,323	11,823	37,275	1,14,948	
1921	1,04,339	12,302	10,650	7,714	9,663	1,44,668	93,601	20,740	1,14,341	12,484	55,703	26,131	44,756	1,39,074	3,98,053	
1922	1,18,000	17,700	3,400	7,500	6,700	1,53,300	1,07,000	37,500	1,44,500	76,500	16,200	51,100	45,400	1,89,200	4,87,000	
1923	1,33,688	29,244	18,814	12,308	4,897	1,98,951	1,19,289	34,196	1,53,485	53,079	15,490	27,119	49,595	1,45,313	4,97,749	
1924	88,472	26,387	7,109	7,225	4,916	1,34,139	97,033	35,516	1,32,549	56,240	30,153	38,506	37,254	1,62,453	4,29,141	
1925	72,322	31,115	6,870	12,520	7,403	1,30,230	1,25,808	61,752	1,87,560	64,239	18,842	38,196	56,448	1,77,725	4,95,515	
1926	57,588	24,492	3,773	3,408	1,879	91,140	71,571	28,314	99,915	35,670	10,629	16,189	37,432	99,920	2,90,975	
1927	2,26,479	28,973	13,967	30,322	16,491	3,16,242	1,07,563	41,450	1,49,013	78,319	38,937	24,923	35,140	1,77,319	6,42,574	
1928	62,454	27,985	4,888	7,602	3,780	1,06,739	77,746	23,967	1,06,713	53,478	36,086	9,568	42,041	1,41,173	3,54,625	
Average 15 years.	1,00,223	21,053	8,828	10,205	6,662	1,46,973	91,560	29,668	1,21,231	52,148	21,961	23,231	36,410	1,33,771	4,01,975	

TABLE V.

Average prices of cloves during 1928/29, month by month, in rupees, compared with the five previous seasons:—

Month.	1923/24.			1924/25.		
	Zanzibar.	Pemba.	Stems.	Zanzibar.	Pemba.	Stems.
July	23.62	24.40	5.78	24.83	22.58	6.31
August	23.97	24.75	5.19	21.28	18.97	4.40
September	24.12	23.33	5.36	18.83	17.07	4.30
October	27.64	26.11	6.19	20.79	18.91	5.55
November	28.49	27.50	7.14	21.22	20.07	5.62
December	28.94	27.75	7.29	19.75	19.41	5.30
January	26.80	26.51	6.94	18.00	18.16	4.81
February	25.51	23.87	6.50	17.66	17.42	4.34
March	25.17	23.12	5.77	17.28	17.62	4.62
April	26.08	22.96	5.25	16.03	16.12	4.24
May	25.50	23.84	5.87	15.37	16.14	4.34
June	21.72	20.01	7.00	16.22	16.57	4.70
Mean price	25.63	24.51	6.19	18.94	18.25	4.88

Month.	1925/26.			1926/27.		
	Zanzibar.	Pemba.	Stems.	Zanzibar.	Pemba.	Stems.
July	18.34	17.72	5.17	14.36	14.09	3.72
August	18.46	17.80	4.64	14.15	14.02	3.48
September	17.35	16.61	4.36	14.27	14.29	3.63
October	17.05	16.73	4.21	14.92	15.03	3.62
November	15.12	16.11	3.85	14.60	14.54	3.96
December	16.35	17.65	4.38	14.36	14.35	3.22
January	16.72	17.61	4.24	12.59	12.60	2.91
February	16.61	17.17	3.99	12.34	12.55	2.98
March	16.98	16.45	3.91	13.32	13.46	2.99
April	16.37	15.97	4.22	13.45	13.11	3.01
May	16.31	16.16	4.19	13.39	13.26	3.03
June	16.32	16.34	3.08	13.47	13.26	2.83
Mean price	16.83	16.86	4.19	13.77	13.71	3.28

Month.	1927/28.			1928/29.		
	Zanzibar.	Pemba.	Stems.	Zanzibar.	Pemba.	Stems.
July	12.31	12.35	2.89	22.49	23.61	4.49
August	12.58	12.48	2.79	21.10	21.25	4.59
September	12.55	12.55	2.72	22.08	21.93	4.63
October	11.67	11.67	2.76	25.04	24.89	6.11
November	11.38	11.25	2.61	28.92	28.29	6.15
December	11.40	11.13	2.30	27.61	27.76	6.02
January	11.99	11.79	3.90	30.98	30.64	6.65
February	12.34	12.14	4.00	30.47	30.85	6.89
March	12.77	12.56	3.69	33.91	33.04	6.75
April	12.91	12.44	3.10	31.14	30.19	6.95
May	14.72	14.20	3.75	32.08	31.65	5.49
June	17.55	17.08	4.00	31.95	31.68	5.37
Mean price	12.85	12.64	3.21	28.15	27.98	5.84

All the above prices are "duty-paid".

TABLE VI.

Export of Copra (Produced in the Protectorate) for the past 24 years
and average price per frasla of 35 lbs.

Year.	Fraslas.	Average for 6 Years.	Average Price. Rs. Cts.	Average 6 Years. Rs. Cts.
1905	4,85,820		2 75	
1906	4,93,688		3 24	
1907	3,79,526		3 76	
1908	5,26,269		2 70	
1909	3,84,260		3 26	
1910	4,82,834		4 14	
		4,58,733		3 61
1911	5,19,081		4 00	
1912	4,76,366		4 19	
1913	4,74,368		4 85	
1914	5,38,112		3 87	
1915	5,49,472		3 73	
1916	3,50,238		4 72	
		4,84,403		4 23
1917	4,21,316		7 10	
1918	2,03,616		3 71	
*1919	9,07,329		5 31	
1920	5,38,595		6 59	
1921	4,99,907		6 60	
1922	4,69,878		5 33	
		5,06,773		5 77
1923	6,01,110		4 82	
1924	6,54,454		4 85	
1925	7,98,803		4 49	
1926	8,18,570		4 34	
1927	6,43,350		4 19	
1928	5,98,966		4 27	
		6,85,875		4 49

*Large holdover from previous year due to shortage of shipping.

TABLE VII.

Monthly Average Price of Copra.

Month.	1927.		1928.	
	Rs. per frasla.	£ per ton.	Rs. per frasla.	£ per ton.
January	4.12	19-15-9	4.37	20-19-5
February	4.16	19-19-4	4.32	20-14-8
March	4.12	19-15-9	4.33	20-15-7
April	4.12	19-15-9	4.36	20-18-5
May	4.15	19-18-4	4.35	20-17-6
June	4.16	19-19-4	4.38	21- 0-4
July	4.15	19-18-4	4.30	20-12-9
August	4.15	19-18-4	4.25	20- 8-0
September	4.25	20- 8-0	4.14	19-17-4
October	4.28	20-10-10	4.11	19-14-7
November	4.35	20-17-6	4.15	19-18-4
December	4.28	20-10-10	4.19	20- 2-3
Yearly average	4.19	20- 2- 4	4.27	20- 9-11

Converted at Re. 1=1s./6d.

TABLE VIII
GOVERNMENT PLANTATIONS.
Survey of Clove Harvest Returns, 1928/29.

Shamba.	Bearing trees.	Green Cloves.		Dry Cloves.		% loss between green and dry.	Dry Stems lbs.
		lbs. Picked.	Amount spent. Rs. cts.	lbs. produced.	lbs. per tree.		
ZANZIBAR.							
Marseilles ..	16,607	16,604	397 16	5,878	0.35	65	1,406
Pasra ..	5,828	2,488	64 71	753	0.13	70	205
Koani ..	3,045	3,556	95 09	1,154	0.38	68	294
Dunga ..	2,961	7,605	221 22	2,497	0.84	67	677
Mgongowangania..	1,639	5,023	103 14	1,527	0.93	70	442
Kizimbani ..	7,792	12,017	301 00	4,030	0.52	66	764
Mlangos ..	11,745	39,327	1,033 02	12,896	1.09	67	2,642
Kidichi and Mdo ..	3,161	84.94	205 78	2,828	0.89	67	527
Mkanyageni ..	5,981	43,029	1,163 56	14,550	2.43	66	2,045
Selem ..	15,730	41,158	1,123 23	13,904	0.88	66	3,677
Kitope ..	6,475	11,223	293 06	3,851	0.51	66	790
Mbaleni Kubwa ...	5,677	20,894	547 72	7,168	1.26	66	1,548
Mbaleni Ndogo ..	2,342	7,695	218 83	2,663	1.13	65	476
Mahonda ..	5,824	30,977	851 17	9,806	1.61	68	1,915
PEMBA.	All	plantations	leased.				
Total ..	94,807	2,50,090	6,618 69	83,515	0.88	67	18,008

TABLE IX.
Seasonal clove crops from Government plantations:—

Season.	Zanzibar *fraslas.	Pemba fraslas.	Total fraslas.	Percentage of whole crop of the Protectorate.
1910/11	1,818	337	2,155	1.12
1911/12	16,475	4,936	21,461	2.80
1912/13	1,526	153	1,679	1.24
1913/14	10,394	4,624	15,018	2.06
1914/15	14,911	1,973	16,884	3.21
1915/16	11,300	4,192	15,492	1.94
1916/17	18,782	2,175	20,957	4.09
1917/18	3,805	684	4,489	1.51
1918/19	20,314	4,575	24,889	3.02
1919/20	1,770	280	2,050	0.78
1920/21	18,785	2,451	21,236	4.28
1921/22	783	1,569	2,352	0.88
1922/23	18,218	4,750	22,968	2.34
1923/24	2,578	272	2,850	0.91
1924/25	15,453	2,164	17,617	2.31
1925/26	15,883	1,051	16,934	2.77
1926/27	8,438	796 (1)	9,234	1.26
1927/28	13,580	1,573 (2)	15,153	2.19
1928/29	2,386	— (3)	2,386	1.19

* One frasla equals 35 lbs.

(1) three plantations only operated; others leased, not included.

(2) three plantations only operated; others leased, not included.

(3) no plantations operated; all leased.

TABLE X.

DEPARTMENT OF AGRICULTURE

Revenue and Expenditure, 1928.

Revenue

			Rs.	Cts
Cloves	...		1,32,607	61
Coconuts	...		1,82,302	14
Miscellaneous	...		2,120	17
Rent of Leased Plantations	...		2,700	06
Ground Rents	...		908	50
Sundries	Plantations	Rs.	16	00
	Others	Rs.	473	45
			489	45
Total Rs.			3,21,127	87

Expenditure.

	Administration.		Chemical.		Plantations.		Gardens.	
Sub-head.	A.		B.		C.		D.	
	Rs.	Cts.	Rs.	Cts.	Rs.	Cts.	Rs.	Cts.
Personal Emoluments ...	1,14,086	81	12,314	20	45,089	99	2,324	01
Labour for Clove picking and drying ...	—	—	—	—	16,457	71	—	—
Labour for Coconut gathering ...	—	—	—	—	8,350	07	—	—
Labour for Cultivation of plantations ...	—	—	—	—	1,09,411	51	—	—
Labour for Copra Factories ...	—	—	—	—	8,306	89	—	—
Labour for Gardens and Open Spaces ...	—	—	—	—	—	—	12,341	36
Uniforms ...	310	24	—	—	40	71	—	—
Incidental Expenses ...	677	18	92	96	77	74	133	46
Passages ...	5,417	02	824	45	—	—	131	50
Materials and Tools ...	742	35	—	—	5,680	30	738	94
Travelling Allowances ...	4,051	72	—	—	450	86	—	—
Transport Allowances ...	1,003	42	27	96	2,708	58	—	—
Transport ...	1,830	53	—	—	7,741	38	31	30
Light and Power ...	253	52	—	—	—	—	118	16
Petrol and Oil for Motor Vehicles ...	1,209	91	—	—	1,234	79	—	—
Repairs of Motor Vehicles ...	1,246	63	—	—	—	—	—	—
Chemicals, Apparatus and Books ...	—	—	2,349	91	—	—	—	—
Repairs of Plantation Houses ...	—	—	—	—	4,641	30	—	—
Purchase of Seeds ...	—	—	—	—	1,587	77	387	07
Repairs to Copra Factories ...	—	—	—	—	974	92	—	—
Surveys of Government Plantations ...	—	—	—	—	6,990	27	—	—
Two Platform Weighing Machines ...	1,904	39	—	—	—	—	—	—
Manures ...	—	—	—	—	1,256	12	—	—
Total	Rs. 1,32,733	72	15,609	48	2,21,000	91	16,205	80

Total departmental expenditure Rs. 3,85,549-91 cts.

TABLE XI.

Comparison of actual revenue and expenditure on the Government plantations year by year:—

YEAR.	REVENUE.			EXPENDITURE.						
	Cloves. Rs.	Coconuts. Rs.	Sundry. Rs.	Total. Rs.	Personal emoluments, Rs.	Cultivation. Rs.	Clove harvest. Rs.	Sundry.		Total. Rs.
								Rs.	Rs.	
1910	35,636	33,009	36,289	1,04,934	10,932	41,839	6,081	8,736	67,588	
1911	1,01,313	41,576	33,601	1,76,493	9,362	54,780	28,366	10,127	1,02,635	
1912	1,63,042	60,443	30,988	2,54,473	14,684	61,238	29,160	15,809	1,21,891	
1913	1,85,185	72,771	29,053	2,87,009	17,962	62,554	38,391	15,643	1,34,550	
1914	67,000	73,745	29,819	1,75,563	32,159	59,663	36,309	12,577	1,40,648	
1915	1,77,977	74,964	25,800	2,78,741	41,660	65,522	52,439	5,785	1,68,406	
1916	1,66,391	74,770	21,039	2,62,200	44,220	70,485	63,146	6,878	1,84,729	
1917	2,50,348	1,01,511	16,321	3,68,180	41,492	79,149	23,535	6,944	1,51,120	
1918	2,13,030	1,19,606	18,263	3,50,899	51,643	90,787	63,404	12,414	2,18,048	
1919	2,08,491	1,27,650	15,708	3,51,849	55,879	1,15,741	37,426	11,229	2,20,275	
1920	95,524	1,57,085	9,900	2,62,509	51,777	1,24,607	35,373	15,050	2,26,787	
1921	3,61,736	1,47,999	18,456	5,28,191	65,410	1,44,979	98,434	21,981	3,30,807	
1922	1,19,925	1,17,495	32,211	2,76,631	75,021	1,55,189	91,386	21,822	3,43,418	
1923	4,28,266	1,82,159	13,642	6,24,067	71,539	1,60,919	64,520	27,380	3,24,358	
1924	1,82,901	1,39,733	11,508	3,34,142	74,920	1,35,048	74,310	25,814	3,10,092	
1925	4,10,240	1,75,784	9,209	5,95,233	58,700	1,53,511	67,334	34,606	3,14,151	
1926	98,933	2,08,789	6,981	3,14,610	51,264	1,46,601	10,381	34,986	2,43,232	
1927	2,03,253	1,99,228	4,524	4,07,010	44,852	1,17,573	46,484	46,257	2,55,166	
1928	1,32,608	1,82,302	5,745	3,20,655	45,090	1,09,412	16,458	50,041	2,21,001	

TABLE XII.

Meteorological Observations, 1928.

Month.	Temperature.						Rainfall.								
	Zanzibar Town.			Pemba, Banani.			Zanzibar.						Pemba.		
	Means of		Absolute	Means of		Absolute	Town. Selen.	Kidiichi.	Koani.	Mlo- kotoni.	Chwaka.	Weti.	Banani.	Mkoani.	Pufuni.
	Max.	Min.	Max.	Min.	Max.	Min.									
January	86.8	80.3	90.2	74.8	88.1	79.8	4.24	4.02	3.69	3.74	1.40	4.91	7.97	3.18	7.28
February	88.5	81.4	91.8	78.0	89.8	81.0	1.06	0.46	0.50	0.24	1.44	0.01	0.00	0.00	0.01
March	87.9	80.3	90.5	74.6	89.4	80.4	5.88	5.19	7.03	7.87	7.07	12.03	7.32	5.66	10.87
April	84.8	78.3	89.2	75.0	86.1	78.2	10.04	13.52	18.48	15.45	13.46	21.60	20.96	32.42	23.97
May	82.7	76.4	86.2	74.0	83.9	76.8	7.69	8.48	9.80	8.82	10.10	11.50	24.71	25.33	23.03
June	81.7	74.5	83.5	72.0	83.5	75.4	4.01	3.50	3.66	2.17	3.86	5.86	7.69	7.13	7.27
July	80.8	72.8	82.9	71.3	83.3	73.9	0.00	0.06	0.00	0.46	0.32	0.00	0.35	0.34	0.14
August	81.0	72.8	84.0	69.8	83.1	73.4	1.19	1.27	0.74	1.39	1.63	3.01	2.40	3.51	3.23
September	82.9	74.3	85.3	73.0	84.7	75.0	1.68	1.55	3.79	3.35	2.47	2.61	0.43	0.31	0.45
October	83.8	75.7	86.2	73.9	86.2	76.1	1.68	2.70	1.00	2.73	1.68	1.31	0.46	0.31	0.56
November	83.4	75.9	86.0	73.2	85.9	77.2	18.95	12.07	14.55	18.63	15.30	7.84	21.12	16.02	13.19
December	86.2	79.4	88.0	75.0	87.6	79.2	2.77	1.46	1.38	1.77	2.64	2.34	2.36	2.34	2.82
For the year	84.2	76.8	91.8	69.8	85.9	77.2	59.19	54.28	64.56	70.06	59.95	60.76	87.18	96.25	92.82

